

As a result of widespread ocean dumping and other pollution problems, marine scientists are studying the populations of various marine organisms in an attempt to determine the effects of pollution. Marine biologists, ecologists and fishing industry investigators are compiling data on aging of marine organisms, including such factors as the relationship between the size and age of the organism, its longevity, its rate of growth and growth differences among species. These factors hold clues to many questions of importance.

Of particular interest because of its great economic value is the surf clam that inhabits the U.S. Atlantic Coast. There exists a method of determining the age of the surf clam: examining photographic blowups of a section of the clam that contains annual rings or growth bands, like a tree. Though useful, this technique has shortcomings, among them difficulty in finding the often faint initial ring and difficulty in getting an accurate count in older clams, whose rings become crowded and run together.



Professor Ernest G. Hammond and a group of students at Morgan State University, Baltimore, Maryland, in cooperation with Goddard Space Flight Center, have been conducting research for several years on a way to apply space developed digital image processing techniques to age determination in clams.

Digital image processing is the use of computers to convert sensor data into informative images. The idea of applying it to clam-aging investigations came from Kevin Peters, a Morgan State graduate student who is shown in the accompanying photograph viewing a high resolution clam image on a

monitor. The Morgan State/Goddard technique involved development of a computer program to create digitized images of clam sections with annual rings. The computerized image can then be enhanced—manipulated to emphasize certain features—in order to improve and amplify the information that can be extracted from the image.

A lengthy series of tests established that the technique offers a number of advantages in aging studies not only of clams but of other shellfish and marine organisms that have growth bands. Among these advantages, with respect to clam studies, are greater contrast

between each annual ring, making it easier to get an accurate count, clearer delineation of the initial ring and the ability to create adequate separation of the crowded ring areas of older clams by enhancing and enlarging the image. The technique also showed promise for being able to reveal information regarding the rate of the organism's growth during seasonal and environmental changes that the organism undergoes. ▲